



STW16NB60

N-CHANNEL 600V - 0.3Ω - 16A TO-247

PowerMesh™ MOSFET

TYPE	V _{DSS}	R _{DS(on)}	I _D
STW16NB60	600V	< 0.35 Ω	16 A

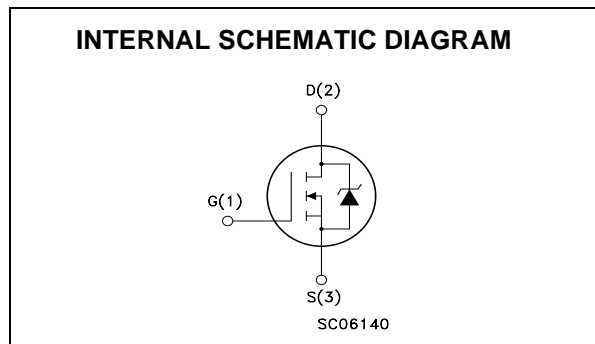
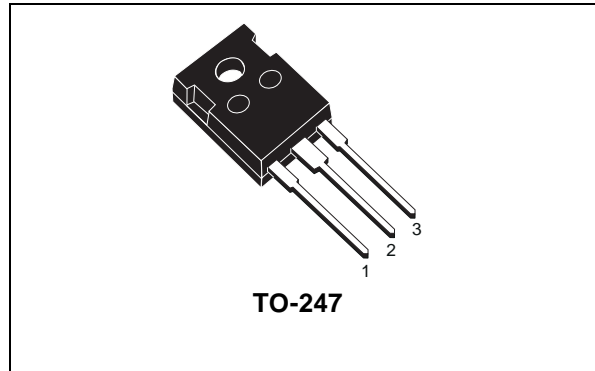
- TYPICAL R_{DS(on)} = 0.3Ω
- EXTREMELY HIGH dv/dt CAPABILITY
- 100% AVALANCHE TESTED
- VERY LOW INTRINSIC CAPACITANCES
- GATE CHARGE MINIMIZED

DESCRIPTION

Using the latest high voltage MESH OVERLAY™ process, STMicroelectronics has designed an advanced family of power MOSFETs with outstanding performances. The new patent pending strip layout coupled with the Company's proprietary edge termination structure, gives the lowest R_{DS(on)} per area, exceptional avalanche and dv/dt capabilities and unrivalled gate charge and switching characteristics.

APPLICATIONS

- SWITCH MODE POWER SUPPLIES (SMPS)
- DC-AC CONVERTERS FOR WELDING EQUIPMENT AND UNINTERRUPTIBLE POWER SUPPLIES AND MOTOR DRIVE



ABSOLUTE MAXIMUM RATINGS

Symbol	Parameter	Value	Unit
V _{DS}	Drain-source Voltage (V _{GS} = 0)	600	V
V _{DGR}	Drain-gate Voltage (R _{GS} = 20 kΩ)	600	V
V _{GS}	Gate- source Voltage	±30	V
I _D	Drain Current (continuous) at T _C = 25°C	16	A
I _D	Drain Current (continuous) at T _C = 100°C	10	A
I _{DM} (●)	Drain Current (pulsed)	64	A
P _{TOT}	Total Dissipation at T _C = 25°C	220	W
	Derating Factor	1.76	W/°C
dv/dt(1)	Peak Diode Recovery voltage slope	4	V/ns
T _{stg}	Storage Temperature	-65 to 150	°C
T _j	Max. Operating Junction Temperature	150	°C

(●)Pulse width limited by safe operating area

(1)I_{SD} ≤ 16A, di/dt ≤ 100A/μs, V_{DD} ≤ V_{(BR)DSS}, T_j ≤ T_{JMAX}.

STW16NB60

THERMAL DATA

Rthj-case	Thermal Resistance Junction-case Max	0.567	°C/W
Rthj-amb	Thermal Resistance Junction-ambient Max	30	°C/W
T _l	Maximum Lead Temperature For Soldering Purpose	300	°C

AVALANCHE CHARACTERISTICS

Symbol	Parameter	Max Value	Unit
I _{AR}	Avalanche Current, Repetitive or Not-Repetitive (pulse width limited by T _j max)	16	A
E _{AS}	Single Pulse Avalanche Energy (starting T _j = 25 °C, I _D = I _{AR} , V _{DD} = 50 V)	600	mJ

ELECTRICAL CHARACTERISTICS (TCASE = 25 °C UNLESS OTHERWISE SPECIFIED)

OFF

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{(BR)DSS}	Drain-source Breakdown Voltage	I _D = 250 μA, V _{GS} = 0	600			V
I _{DSS}	Zero Gate Voltage Drain Current (V _{GS} = 0)	V _{DS} = Max Rating V _{DS} = Max Rating, T _C = 125 °C			1 50	μA μA
I _{GSS}	Gate-body Leakage Current (V _{DS} = 0)	V _{GS} = ±30V			±100	nA

ON (1)

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
V _{GS(th)}	Gate Threshold Voltage	V _{DS} = V _{GS} , I _D = 250 μA	2	3	4	V
R _{DS(on)}	Static Drain-source On Resistance	V _{GS} = 10V, I _D = 8A		0.3	0.35	Ω

DYNAMIC

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
g _{fs}	Forward Transconductance	V _{DS} > I _{D(on)} × R _{DS(on)max} , I _D = 8A		14.5		S
C _{iss}	Input Capacitance	V _{DS} = 25V, f = 1 MHz, V _{GS} = 0		3300		pF
C _{oss}	Output Capacitance			465		pF
C _{riss}	Reverse Transfer Capacitance			45		pF

ELECTRICAL CHARACTERISTICS (CONTINUED)

SWITCHING ON

Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{d(on)}$	Turn-on Delay Time	$V_{DD} = 300V, I_D = 8 A$ $R_G = 4.7\Omega, V_{GS} = 10V$		35		ns
t_r	Rise Time	(see test circuit, Figure 3)		16		ns
Q_g	Total Gate Charge	$V_{DD} = 480V, I_D = 16 A,$ $V_{GS} = 10V, R_G = 4.7\Omega$		80	105	nC
Q_{gs}	Gate-Source Charge			19.5		nC
Q_{gd}	Gate-Drain Charge			35		nC

SWITCHING OFF

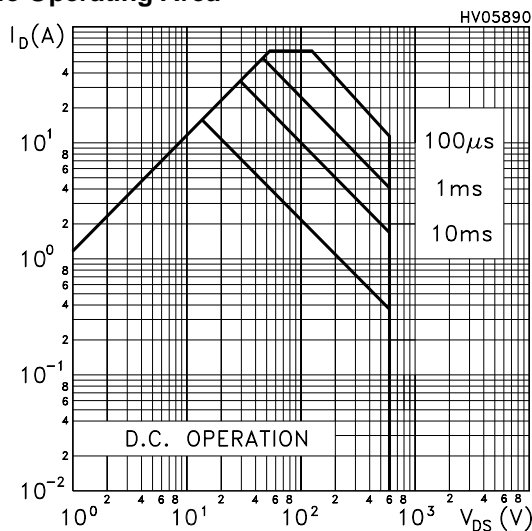
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
$t_{r(Voff)}$	Off-voltage Rise Time	$V_{DD} = 480V, I_D = 16 A,$ $R_G = 4.7\Omega, V_{GS} = 10V$		15		ns
t_f	Fall Time	(see test circuit, Figure 5)		12		ns
t_c	Cross-over Time			30		ns

SOURCE DRAIN DIODE

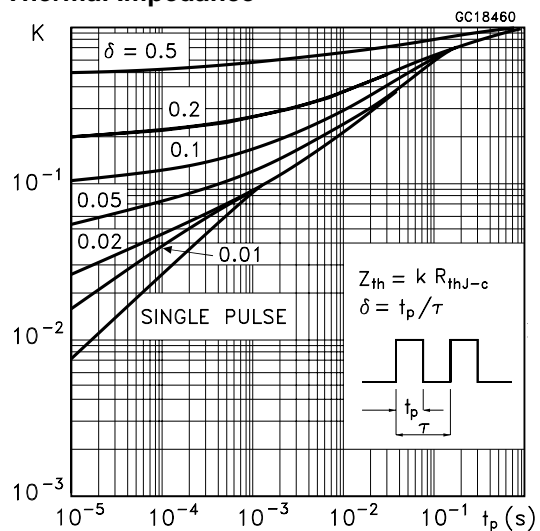
Symbol	Parameter	Test Conditions	Min.	Typ.	Max.	Unit
I_{SD}	Source-drain Current				16	A
$I_{SDM} (2)$	Source-drain Current (pulsed)				64	A
$V_{SD} (1)$	Forward On Voltage	$I_{SD} = 16 A, V_{GS} = 0$			1.6	V
t_{rr}	Reverse Recovery Time	$I_{SD} = 16 A, di/dt = 100 A/\mu s,$ $V_{DD} = 100V, T_j = 150^\circ C$		800		ns
Q_{rr}	Reverse Recovery Charge	(see test circuit, Figure 5)		11		μC
I_{RRM}	Reverse Recovery Current			27		A

Note: 1. Pulsed: Pulse duration = 300 μs , duty cycle 1.5 %.
2. Pulse width limited by safe operating area.

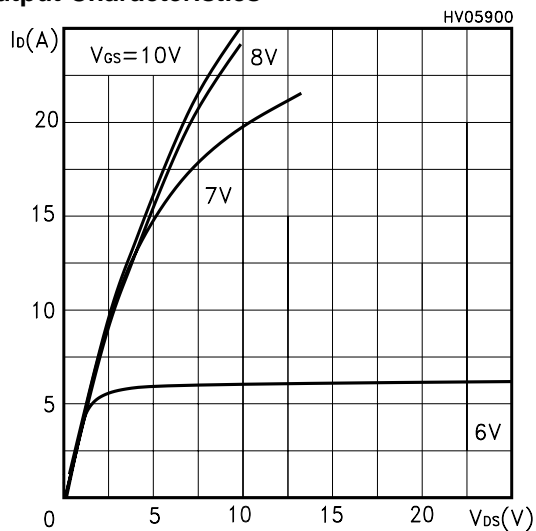
Safe Operating Area



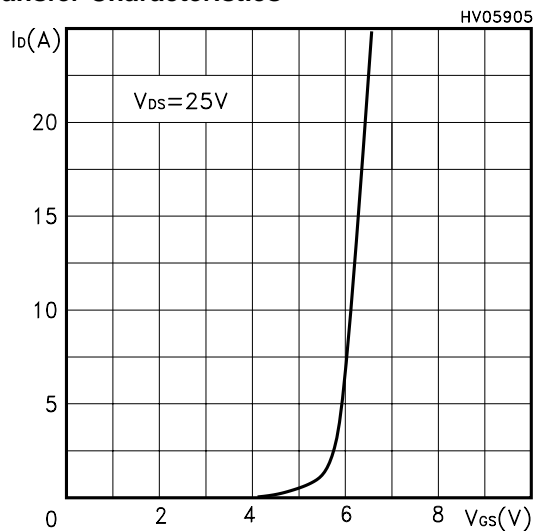
Thermal Impedance



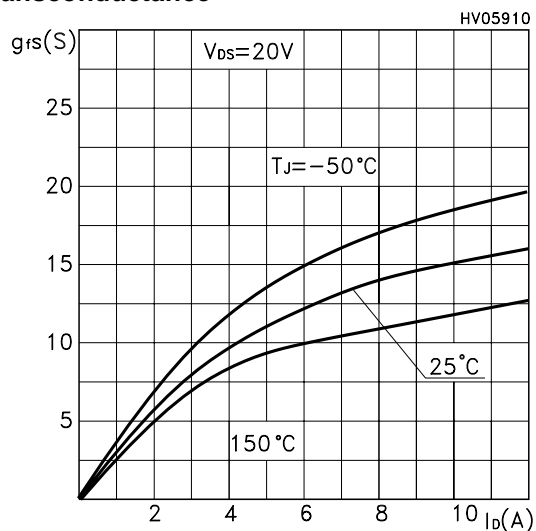
Output Characteristics



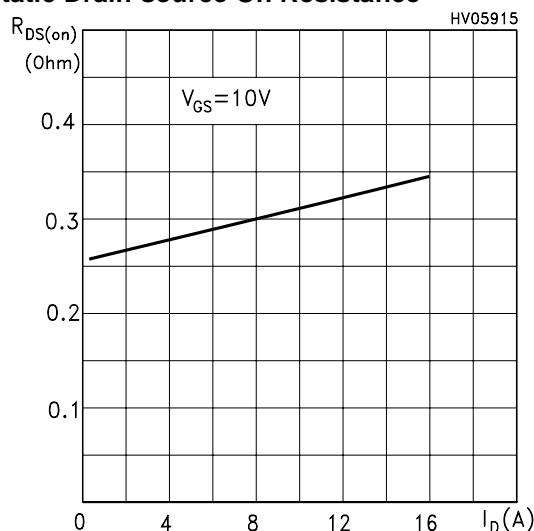
Transfer Characteristics



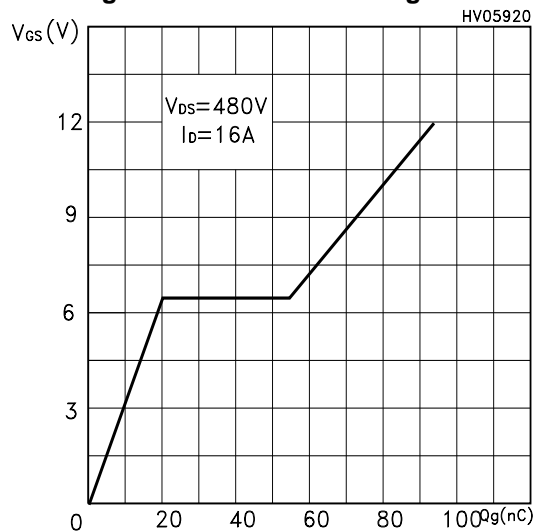
Transconductance



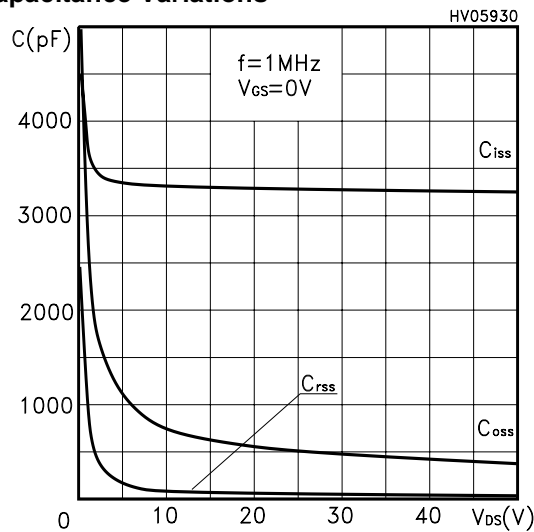
Static Drain-source On Resistance



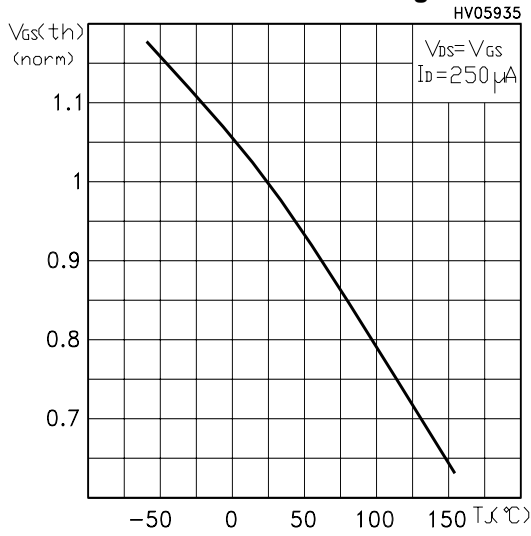
Gate Charge vs Gate-source Voltage



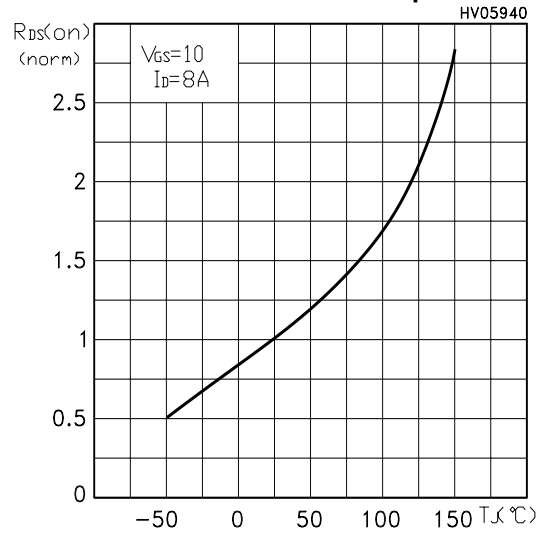
Capacitance Variations



Normalized Gate Thershold Voltage vs Temp.



Normalized On Resistance vs Temperature



Source-drain Diode Forward Characteristics

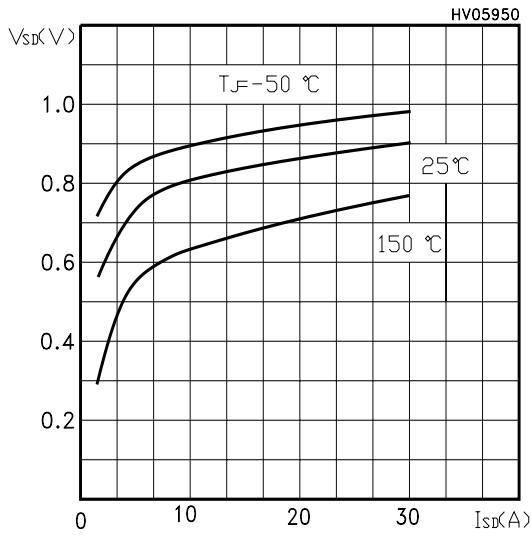


Fig. 1: Unclamped Inductive Load Test Circuit

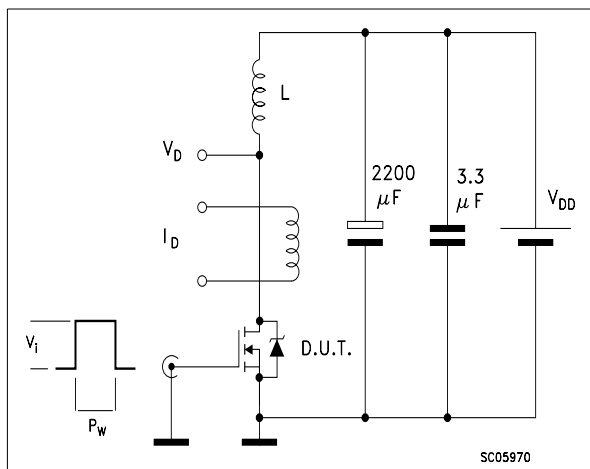


Fig. 2: Unclamped Inductive Waveform

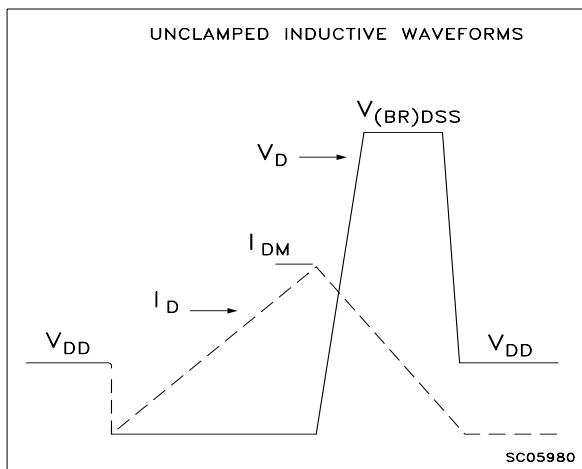


Fig. 3: Switching Times Test Circuit For Resistive Load

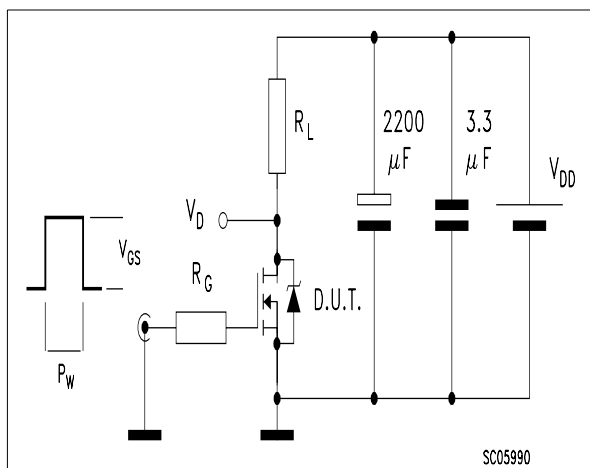


Fig. 4: Gate Charge test Circuit

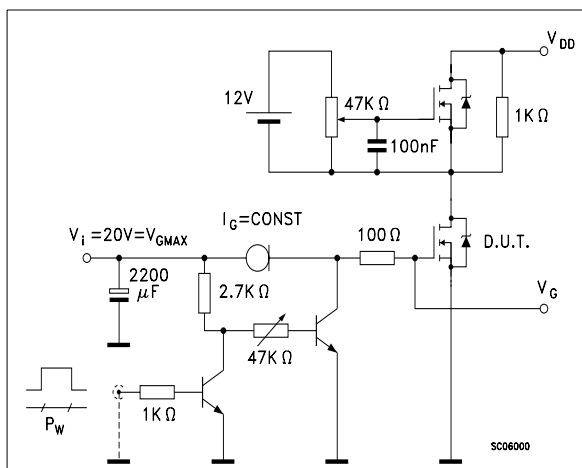
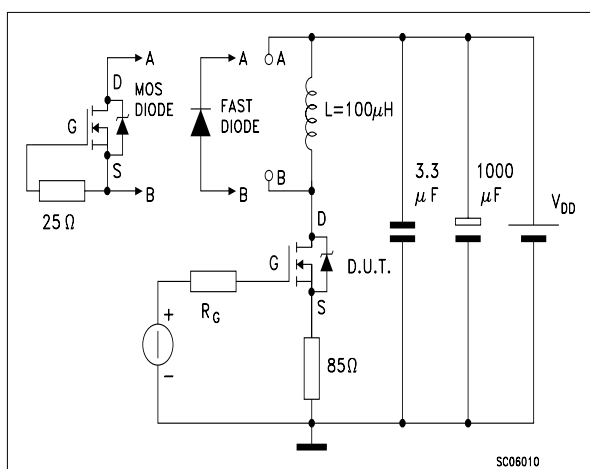
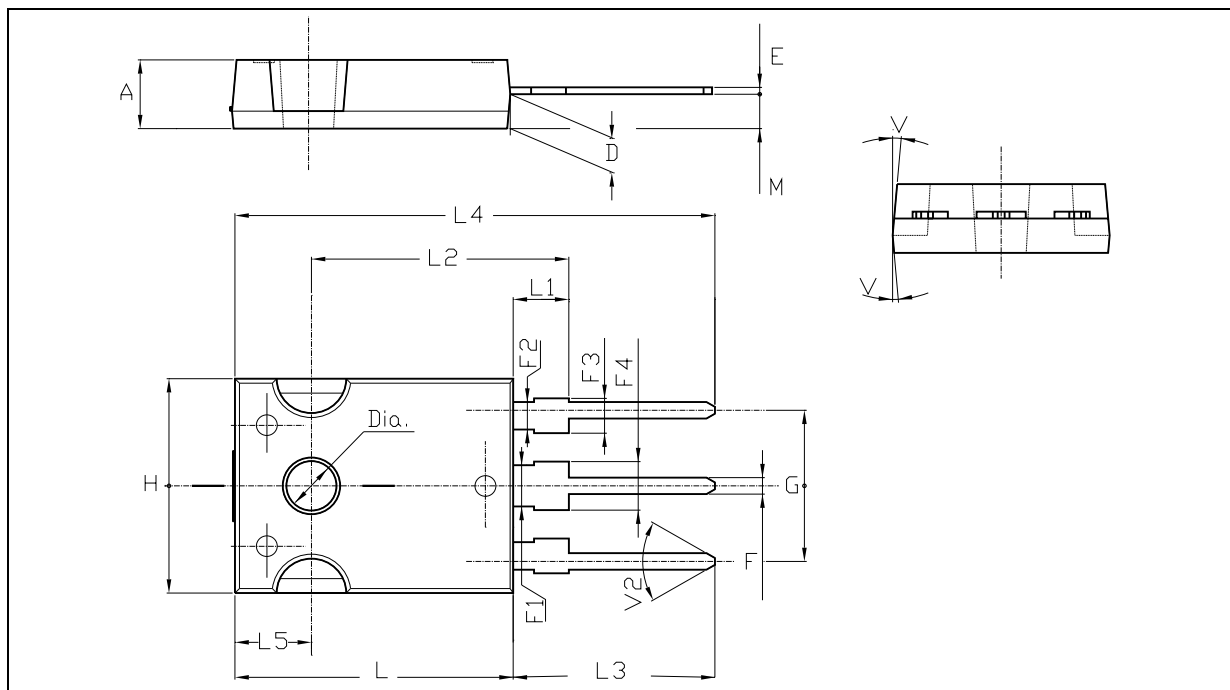


Fig. 5: Test Circuit For Inductive Load Switching And Diode Recovery Times



TO-247 MECHANICAL DATA

DIM.	mm.			inch		
	MIN.	TYP	MAX.	MIN.	TYP.	MAX.
A	4.85		5.15	0.19		0.20
D	2.20		2.60	0.08		0.10
E	0.40		0.80	0.015		0.03
F	1		1.40	0.04		0.05
F1		3			0.11	
F2		2			0.07	
F3	2		2.40	0.07		0.09
F4	3		3.40	0.11		0.13
G		10.90			0.43	
H	15.45		15.75	0.60		0.62
L	19.85		20.15	0.78		0.79
L1	3.70		4.30	0.14		0.17
L2		18.50			0.72	
L3	14.20		14.80	0.56		0.58
L4		34.60			1.36	
L5		5.50			0.21	
M	2		3	0.07		0.11
V		5°			5°	
V2		60°			60°	
Dia	3.55		3.65	0.14		0.143



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